COMMUNICATION FACILITIES

At airports where Weather Bureau airport stations are established the Government provides all necessary communication facilities, such as long-distance telephone, telegraph, teletype circuits, and radio stations. Municipal and private airports without such a station can easily avail themselves of all meteorological information. An airport located near a Government airway station where long-line teletype facilities are available can arrange for a drop on the circuit whereby the airport pays for its own drop. Also the installation of an inexpensive short and long wave radio receiving set is essential. Reports transmitted by the Weather Bureau to the Department of Commerce radio station are transmitted on the long-line teletype as well as broadcast by voice. For the preparation of 12-hour synoptic maps and multilevel upper air maps, it will be necessary for the airports to arrange to have an operator copy the Weather Bureau broadcast from the naval radio. An airport complying with the A 1 A requirements needs this tie in with the Government communication system before it can hope to give its pilots the best service obtainable.

METEOROLOGICAL INSTRUMENTS AND FACILITIES

For the larger important airports an ideal instrumental layout is as follows: Pressure tube anemograph, mercurial barometer, high-grade aneroid barometer, barograph, hygrothermograph, psychrometer, maximum minimum and exposed thermometers, rain gage, sunshine recorder, pilot-balloon equipment, ceiling projector with alidade, and an airplane meteorograph. In this list the pressure-tube anemograph was selected in preference to the wind vane, anemometer, and recorder because a record of wind fluctuations and gustiness is needed at important airports. A mercurial barometer is needed for accurate measurements of barometric pressure. A record of temperature and humidity as obtained with a hygrothermograph and psychrometer is important. All airports have more or less fog to contend with during certain periods of the year, and a continuous record of relative humidity and temperature will be useful in research work on this problem. In addition, the dew point of the air is required when giving airway weather reports. A sunshine recorder is of value for records of beginnings and endings of cloudiness or fog at the airport. Pilot-balloon equipment is recommended for airports employing meteorologists, especially where the airport is far removed from a Weather Bureau aerological station. Even if located close to a Weather Bureau aerological station, frequently an observation can not be obtained at the Weather Bureau station because of local low clouds or fog, while an airport meteorological station several miles away could make the observation in a clear sky or vice versa. In one case this is carried on successfully through the Government station advising the municipal station at times when low clouds interfere with the observation at the Government station. The ceiling projector and alidade for measuring the ceiling or altitude of the clouds at night is required for a class A rating. Height of ceiling, a difficult observation at best, is made extremely simple with this equipment. All airports should have this equipment, regardless of whether or not a meteorological station is planned. An airplane meteorograph has been included with the list of meteorological instruments for airports employing meteorologists for the reason that upper air records are badly needed. The airport meteorologist would have little difficulty in securing the pilot's cooperation in this work.

Substitutions and omissions in the above list of instruments may be made, of course, to meet the requirements and budget of each individual airport. The rule to follow in selecting meteorological instruments is to begin with the basic requirements of an "A" rating and substitute or supplement with self-recording instruments as far as possible.

Under "Facilities" an airport should provide space and office equipment for a meteorological office in the administration building. The office should contain a bulletin board showing current upper-air wind data from surrounding aerological stations, United States Weather Bureau airway forecasts, current airway weather reports, and a daily weather map. Wall maps, topographic maps, and airway strip maps are desirable in the meteorological office.

It is interesting to note that one after another of the problems affecting commercial aviation have been overcome; motors have been developed to the point where with proper care seldom is there a complete failure; instruments have been developed and improved; pilots are becoming more and more experienced; planes have been improved for speed and safety; and now one of the vital problems affecting commercial aviation—i. e., the weather problem—is being investigated and minimized by the installation of meteorological instruments, by fast communication service, by the tie in of airports with the Government airway meteorological and communication system, and by the employment of meteorologists at airports.

551.515 (73)

WHAT A TORNADO LOOKS LIKE

By S. D. Flora

A well-developed tornado is the most amazing and terrifying atmospheric phenomenon ever seen in inland America. The first sight of one at a distance—and a hundred or more occur each year in the country—gives the impression of a contradiction of nature's laws that permits such a storm to form at all. As it approaches with its peculiar whistling sound that rapidly changes to a terrific roar and buildings are blown to pieces as though they were made of cards, the effect is enough to strike terror in the stoutest of hearts.

Contrary to the popular idea, a tornado seldom gives the impression of a huge inverted funnel. It has been more commonly described by eyewitnesses as a gigantic elephant trunk writhing about or a long rope dangling from the sky that spreads destruction where ever it touches the ground.

One of the most spectacular tornadoes on record struck the edge of Hardtner, Kans., about 5:15 p. m. of June 2, 1929. The sky was only partly overcast at the time and the sun shone full on the pendant cloud, making it a striking sight for 30 miles across the almost level country adjoining. Instead of moving at express-train speed, as tornadoes generally do, this one seemed to loiter and remain almost stationary for the greater part of half an hour.

In describing it an eye witness said, "If you can imagine a big, gray elephant trunk or sausage balloon strung across the town with the upper end in the clouds and the lower switching about in a cloud of dust on the ground, you can imagine something of what the twister looked like when it passed Hardtner."

When the tornado disappeared, ambulances were rushed to Hardtner from as far as Alva, Okla., almost 20 miles distant, under the supposition that the town had been wiped out and hundreds of persons mangled or killed. Fortunately only the edge of the town had been struck and no one was injured. People had seen the tornado approaching and had taken to storm caves—the well known "cyclone cellars" of the West—and basements, where they were safe. After the disturbance was over it was reported, "People came out of the ground like ants."

As in the case of many tornadoes, this one was accompanied by a heavy fall of hail. At Kiowa, 10 miles to the east, where the sun could still be seen shining over the top of the tornado cloud, slugs of ice, disk shaped, and 2½ inches wide and almost an inch thick, fell in the sunlight like gleaming meteors out of a black cloud that backed in from the east. Finally, the parent cloud of the tornado merged with the black hail cloud and the whole mass moved off toward the northeast.

551.515 (759)

PENSACOLA WATERSPOUT OF JUNE 14, 1929

By Lieut. P. G. HALE, U. S. Navy

A waterspout occurred in Pensacola Bay from 9:31 to 9:37 on the morning of the 14th of June, 1929. A somewhat detailed report of the occurrence is made, for it is believed that some new data will be made available for the study of waterspouts. The waterspout was not a large one and lasted only six minutes, but it is the attendant data which excuses the length of the report.

To begin with, an aerograph (airplane meteorograph) flight was made that morning up to 3,000 meters. The writer of this article was the observer. The following are the notes taken during the flight:

Takeoff at 0624. Light haze. Tall cumulus over the Gulf of Mexico. Few strato-cumulus around the horizon. Base of the cumulus about 450 meters. Haze ring to the east at an altitude of about 2,800 meters, cumulus thrust through it in places. Tops of the cumulus over the Gulf of Mexico were well over 3,000 meters. Quite bumpy throughout the flight. Top of the flight at 0646.

After landing the data were worked up, using an adiabatic chart and a tephigram chart to plot them. The instrument used on the flight was a Friez aerograph, type Aero-1928-USN, No. 51. Frequent calibrations insure that the instrument is reasonably correct. A copy of the work sheet used in picking off the data from the aerograph chart accompanies this report.

On the adiabatic chart (fig. 2) there are plotted (1) a temperature-pressure curve; (2) a curve to determine graphically the altitude of the significant points; (3) a humidity-pressure curve; (4) a wind velocity curve, from pilot balloon ascent at 0600; (5) wind velocity-altitude curve, from pilot balloon ascent immediately following the waterspout, about 10 a. m.; and (6) a vapor pressure-pressure curve. These various curves are labeled on the adiabatic chart. The 6 a. m. pilot balloon ascent reached an altitude of only 1,530 meters, when the balloon was lost due to haziness. The ascent immediately following the waterspout was made to an altitude of 5,300 meters, where the balloon disappeared behind a cumulus cloud.

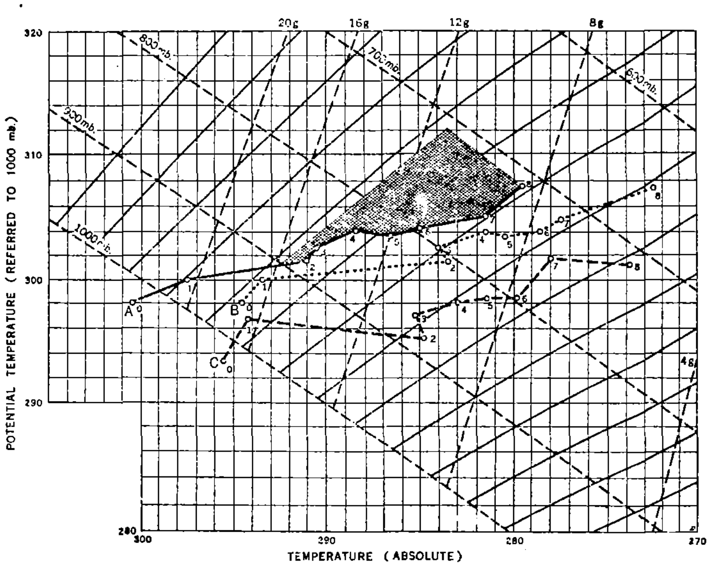

FIGURE 3.—Enlarged portion of tephigram of Figure 2. (See text.)

The aerograph sounding is plotted on a tephigram chart (fig. 3) the scale of which is rather small, so an enlarged portion of the tephigram chart is magnified and the sounding replotted on it to better show the details. Both the tephigram chart and the magnified portion on a separate page are submitted with this report (fig. 3).

The upper left curve "A" is the tephigram or temperature-potential temperature curve on the tercentesimal scale. The lower right hand curve "C" is the dew-point temperature plotted against the pressure. The central curve "B" is a curve connecting the points at which air rising adiabatically from points on the tephigram, curve "A," would become saturated and begin to form cloud.

For a description and better understanding of the curves plotted see "Physics of the Air," by W. J. Humphreys, second edition, 1929, pages 259–261.

The shaded area represents the energy-per-unit mass of saturated air available for convection from lower to higher levels. The upper right edge is cut off at the end of the tephigram, as no information is available above point "8" and no assumptions are made. It might be noted that the entire area as shaded really is representative of the energy available at point "1." An area almost as large would represent the energy available at the surface or point "0." At point "2" there is no energy available and but a slight amount at point "3." Another feature of the tephigram, curve "A," is that except between points "2" and "3" and points "7" and "8" the curve is more nearly horizontal than the psuedo-adiabats, and thus air from the surface up to point "7" once saturated becomes unstable except for the shallow layer between "2" and "3."

Tephigrams are drawn daily as part of the routine at the United States naval air station, Pensacola, Fla., and they are completed prior to the completion of the weather map. So far, their principal use has been in the prediction of thunderstorms for the current day. This is based on a study of the size of the energy area and the levels at which energy is available. In general when curves "A" and "B" are widely separated and the energy does not exist thunderstorms do not occur. When the two curves are close together and the energy area is evident but not large, thunderstorms may or may not occur. When